Yanos Aerospace Integrates Machining Spindle Test Stand for Boeing Using PXI and LabVIEW

by Ronald Yanos, Yanos Aerospace Inc.
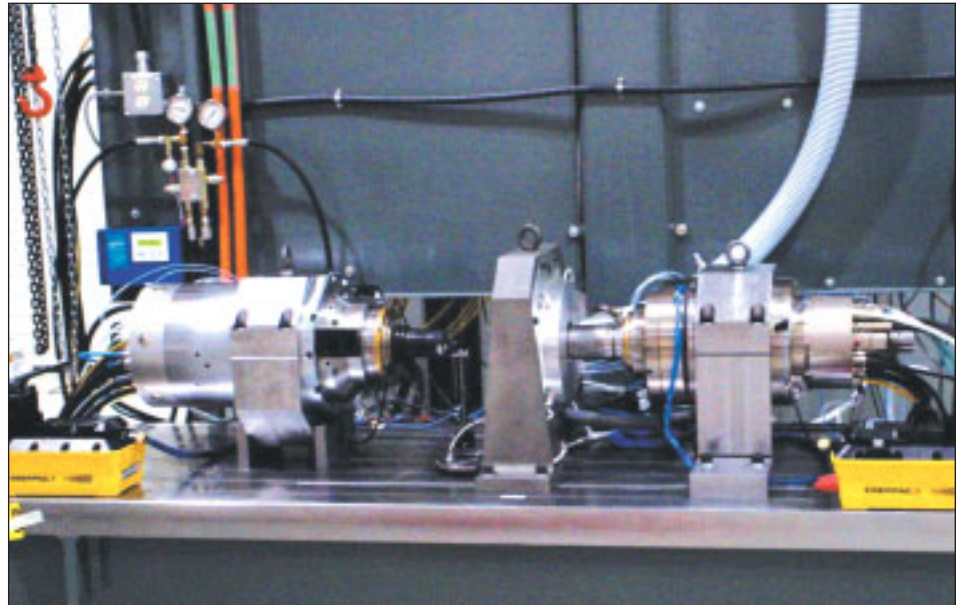
The Challenge: Integrating a complex automated control system with continuous, high-speed acquisition of data for monitoring and post-event analysis.

The Solution: Customizing ActiveX components for specific control functions and seamless integration with National Instruments LabVIEW software for complete control over the test sequences, data storage, and interface to external systems.

Data Acquisition, Control, and Analysis

We provide data acquisition and control solutions to aerospace and other related industries. These data acquisition systems vary from low-speed, steady-state (100 Hz) to high-speed dynamic (50,000 Hz) systems. Applications such as testing of gas turbine engines, machining spindle test stands, vibration analysis, and control systems use these solutions.

We developed a machining spindle test stand for R&D testing of machining spindles used in the production of various components within Boeing's production

The Machining Spindle Test Stand

National Instruments products formed the core of the system for both the software and the hardware. We seamlessly integrated the custom ActiveX components for specific control functions with the LabVIEW software allowing complete control over the test sequences, data storage, and interface to external systems.

facilities. We provided the full data acquisition, control, and analysis system. The functions of this test stand include:
• Validation testing of spindle performance
• Spindle drive testing
• Lubrication system testing, and
• Spindle endurance testing

Integration

Our data acquisition system fully integrates with all the mechanical systems, support systems, and variable frequency drives to ensure complete acquisition, control, and alarm response through a single user interface.

This high-speed acquisition system processes 40 channels at 50 k samples per second (high-speed) and 64 channels at 128 samples per second (low-speed). It includes a 30-minute circular buffer that we can freeze at any point with an alarm. We can use the full suite of tools for online, real-time viewing of high-speed and low-speed data.

The central control system of the spindle test stand includes a LabVIEW-based user interface with programmable automated test cycles and screen monitoring of all system parameters.

System Solution

The problem that led to the National Instruments solution was the integration of a complex automated control system with continuous high-speed acquisition (50 KHz) of data for monitoring and post event analysis. The system required the use of a 30-minute circular buffer for low and high-speed channels, as well as the tools to analyze the buffer data.

Other solutions investigated prior to the selection of the NI4472 cards and associated hardware included dedicated recorder devices.

In addition, by using the LabVIEW solution, we could incorporate alarm monitoring and integrate interfaces to other equipment, such as programmable logic controllers.

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LabVIEW software provides complete control over the test sequences, data storage, and interface to external systems.

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Design Capability

We used the high-speed acquisition, DSC, and GUI features for this application, to ensure that the test stand functioned reliably.

Because of the high costs associated with conducting spindle tests in R&D, or production environment, using the Boeing Spindle Test Stand will allow for complete testing of spindles before they are commissioned into production. We can analyze the data collected during test cycles to ensure the spindle and its subsystems are utilized to their maximum design capability or pinpoint potential problem areas. ∎
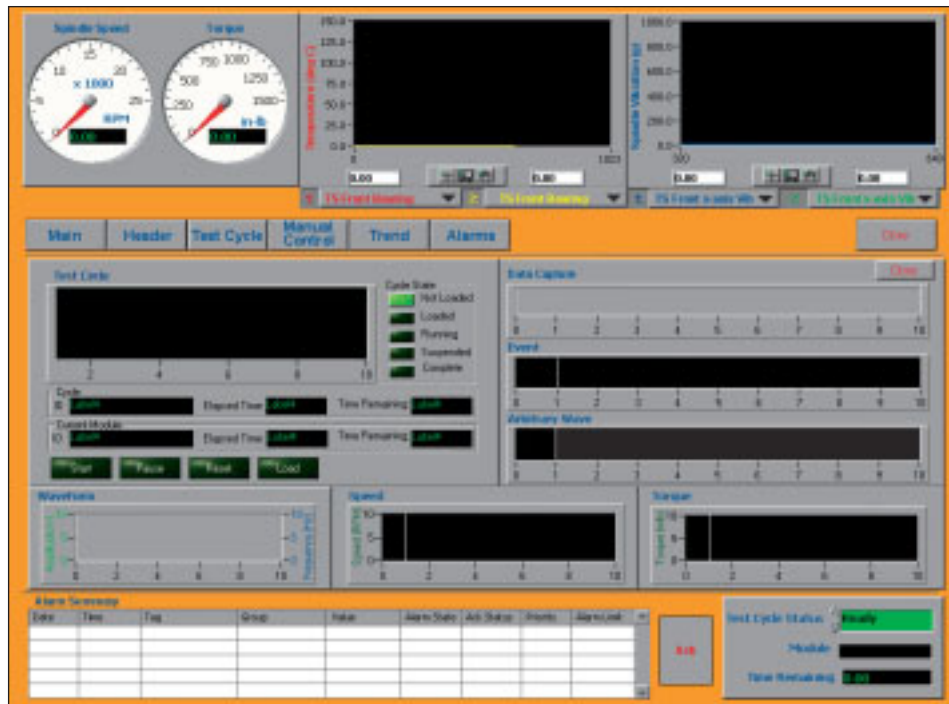
Test Cycle Screenshot

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